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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules	)	WT Docket No. 99-168

To: The Commission

REPLY COMMENTS OF AIRTOUCH COMMUNICATIONS, INC.

AIRTOUCH COMMUNICATIONS, INC.

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August 13, 1999

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SUMMARY

In its comments, AirTouch demonstrated that numerous factors support licensing this spectrum for land mobile services, and that licensing the spectrum in large, paired blocks and pursuant to flexible technical, operational and ownership rules would best serve the public interest. AirTouch also demonstrated that authorizing this spectrum for both new broadcast and land mobile services would disserve the public interest.

The record submitted in this proceeding thus far supports licensing this spectrum for land mobile services. Propagation characteristics for the 700 MHz band, its proximity to existing CMRS spectrum, and projected demand for 3G and transitional second-generation CMRS services, all support land mobile licensing. Comments indicate further that large paired spectrum blocks are necessary for viable CMRS services in this spectrum, and that large service areas -- not smaller than MTAs -- are warranted. Reserving a segment of these bands for PMRS services is unnecessary. Parties' proposed restrictions on CMRS eligibility should be rejected as well.

The record also indicates that mixed spectrum use between land mobile and new broadcast licensees is infeasible and will hinder deployment of 3G services in this spectrum. Assertions by proponents of new broadcast licensing as to technical requirements for land mobile services, and the feasibility of mixed use, are mistaken. Land mobile services are efficient, highly standardized, and already are evolving to accommodate multimedia/broadband applications. Broadcast use does not accommodate the same diversity of services, and will cause significantly greater harmful interference problems for land mobile licensees than vice-versa. In addition, the technical advantages for land mobile use of this spectrum militate strongly in favor of land mobile licensing and against mixed broadcast and land mobile use.

Finally, licensing this spectrum for CEMA's proposed MMBS service is premature. Such licensing will result in non-intensive, inefficient spectrum use for a considerable period of time and has considerable technical obstacles to overcome. In addition, much of what MMBS would purportedly offer to consumers is already envisioned for 3G services. Licensing this spectrum for land mobile use, unlike CEMA's proposal, will promote the Commission's statutory obligations for this spectrum.

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REPLY COMMENTS OF AIRTOUCH COMMUNICATIONS, INC.

AirTouch Communications, Inc. ("AirTouch"), hereby replies to comments filed in response to the *Notice of Proposed Rulemaking* in the above-captioned proceeding.[1] For the reasons discussed herein, comments in this proceeding demonstrate that licensing the 746-764 MHz and 776-794 MHz bands for land mobile and fixed services will best serve the public interest and the Commission's statutory obligations. The record submitted thus far also underscores (1) the infeasibility of the sharing of these bands between land mobile and new broadcast licensees, and (2) that such sharing will deter CMRS participation at auction and hinder the deployment of CMRS services in this spectrum. This spectrum should not be licensed for new broadcast use or new broadcast-type services.

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[1] *In the Matter of Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules, Notice of Proposed Rulemaking*, WT Docket No. 99-168, FCC 99-97 (rel. June 3, 1999) ("*NPRM*").

INTRODUCTION

As AirTouch demonstrated in its comments, numerous factors support licensing this spectrum for land mobile services, including the demonstrated demand for additional spectrum for 3G services and transitional mobile telephony needs, the proximity of the spectrum to existing mobile telephony bands, efficient spectrum use, and minimizing harmful interference between users. AirTouch further demonstrated that licensing the spectrum in large, paired blocks, and subjecting CMRS users of the spectrum to flexible technical, operational and ownership requirements, will promote competition among CMRS providers and serve the Commission's statutory "flexible use" obligations under the 1997 Budget Act and the competitive bidding requirements of Section 309(j). As discussed herein, comments in this proceeding support AirTouch on a number of these important issues.

AirTouch also demonstrated that unbridled use of this spectrum, in which both new broadcast and mobile services would be authorized, would disserve the public interest by resulting in inefficient spectrum use, increasing the likelihood of harmful interference, and effectively precluding the deployment of CMRS services. A number of commenters, however, contend that both new broadcast and CMRS services should be authorized in this spectrum, and that the Commission should take steps to facilitate continued broadcast use of the spectrum. As AirTouch discusses below, these arguments are technically flawed and, moreover, such shared spectrum use will undermine important statutory objectives. Another commenting party, the Consumer Electronics Manufacturers Association ("CEMA") advocates licensing this spectrum for an entirely new broadcast-type service, to the exclusion of CMRS or fixed wireless services.

This proposal is technically flawed as well and, moreover, such licensing risks inefficient spectrum use and will minimize interest in this spectrum at auction.

DISCUSSION

I. THE RECORD SUBMITTED IN THIS PROCEEDING SUPPORTS LICENSING THIS SPECTRUM FOR LAND MOBILE SERVICES

A number of parties support licensing this spectrum for land mobile services for many of the same reasons discussed in AirTouch's comments, such as the propagation characteristics of the 700 MHz band, efficiencies in handset manufacture and network deployment resulting from the proximity to existing 800 MHz CMRS spectrum, and projected demand for 3G services and transitional second-generation services.[2] AirTouch further submits that the band plans recommended by a number of CMRS providers underscore a legitimate consensus that the pairing of such large blocks is essential to providing viable CMRS services in this spectrum.[3] In addition, given the acknowledged need for licensees in the band to accommodate incumbent broadcast licensees' service areas, and the efficiencies resulting from larger service areas, AirTouch reiterates its support for large regional or nationwide licensing -- in no event should licenses authorize a service area smaller than an MTA.

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[2] *See* AirTouch at 4-11 (citing to favorable propagation, demand for CMRS, footprint expansion, 3G services, and economies of scale/scope); U S WEST at 6-7 (demand, footprint, economies of scale/scope); RTG at 3; InTek at 2-4 (favorable propagation, demand); *see also* Arraycom at 2 (propagation; SBC at 1-2 (supports flexible use, but also supports paired licensing and cites to 3G).

[3] *See* AirTouch at 16-18 (two 18 MHz licenses, each with 2 x 9 MHz paired spectrum); RTG at 8-9 (same); SBC at 2 (same); U S WEST at 3-6 (two licenses of 24 MHz and 12 MHz).

A number of parties also advocated licensing a segment of this spectrum for private mobile wireless services.[4] As discussed in its comments, AirTouch supports authorizing carriers to provide CMRS or PMRS services over the spectrum.[5] Reserving a specific spectrum block for PMRS services, however, is unnecessary and would limit the viability of the spectrum for CMRS services. Authorizing private mobile use of spectrum won at auction, as AirTouch proposes, will provide sufficient opportunity for non-CMRS use of this spectrum, while ensuring that the Commission's statutory obligation to license this spectrum for commercial use is met.[6]

Within the CMRS-fixed licensing limitations, the Commission's rules should provide for maximum flexibility in terms of operational, technical, and ownership requirements.[7] AirTouch therefore opposes limiting this spectrum to a particular class of CMRS providers or applying this spectrum to the 45 MHz CMRS spectrum cap, as Southern proposes.[8] Such restrictions would arbitrarily limit CMRS participation in the auction and devalue the spectrum at auction.[9]

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[4] *See* Motorola at 12-13; MRFAC at 1-4; AMTA at 2-7; ITA at 12-14; APCO at 5-6; PCIA at 4; Union Pacific RR at 1-2; UTC at 2-4.

[5] *See* AirTouch at 21.

[6] *See* 47 U.S.C. § 337(a)(2).

[7] AirTouch at 20-21, 27-28 (generally supporting flexible Part 27 rules); U S WEST at 2 n.2 (same); RTG at 9-10 (opposes application of spectrum cap); *see also* SBC at 5 (supporting proposed RF emission limits).

[8] *See* Southern at 3-4 (supports "ESMR-only" in 18 MHz of the spectrum) and 7 (spectrum cap); *see also* UTC Comments at 5 (spectrum cap); KM Communications at 4 (same).

[9] *See* AirTouch at 22-25.

II. MIXED SPECTRUM USE BETWEEN LAND MOBILE AND NEW BROADCAST LICENSEES IS INFEASIBLE AND WILL HINDER DEPLOYMENT OF 3G SERVICES IN THE 746-764 MHz and 776-794 MHz BANDS

AirTouch and a number of commenting parties demonstrated that shared broadcast and mobile use raises serious concerns for adjacent channel interference and will deter widespread CMRS participation in the auction of this spectrum. Moreover, the Commission has already accounted for incumbent broadcast needs pursuant to the DTV transition plan.[10] As discussed below, arguments that "flexible use" licensing as the Commission proposes will facilitate sharing between mobile and new broadcast licensees are technically flawed and premised on erroneous assumptions regarding land mobile wireless spectrum use.[11]

A. Advocates of New Broadcast Licensing Understate the Harmful Interference Issues Resulting from Shared Use and Misstate the Spectrum Demands for New Land Mobile Services

A number of parties support licensing of this spectrum for new broadcast use, and make a variety of assertions regarding the characteristics and technical needs of land mobile services.[12] Disney asserts an interest in "explor[ing] wireless hybrid broadcast/Internet

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[10] As Motorola explains, licensing this spectrum for new broadcast services would undermine the Commission's policy of transitioning broadcast television operations to spectrum in channels 2-51. Motorola at 8 (citing *Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service, Sixth Report and Order*, MM Docket No. 87-268, 12 FCC Rcd. 14588, ¶ 76 (1997)). For these reasons also, the Commission should reject proposals to provide added protection for secondary LPTV operations. *See* KM Communications at 4-5 (proposes delaying the auction until after the DTV transition has been completed in 2006 to accommodate LPTV relocation).

[11] As AirTouch and U S WEST discussed in their comments, incumbent broadcast licensees operating on a primary basis will be afforded full interference protection through the DTV transition period. *See* AirTouch at 13 n.33; U S WEST at 9-10; *see also* APTS at 1-5; Disney at 5-6 (supporting protection for broadcast incumbents).

[12] Disney at 4-5; KM Communications at 1-2; AMSTV at 2-4

combinations," and AMSTV similarly discusses "a hybrid broadband and mobile service" in the context of "broadcast and other broadband applications."[13] Disney further asserts that its proposal "would accommodate fixed and mobile wireless services" including 3G services.[14] In advocating a single 36 MHz license, AMSTV asserts that "two-way mobile and data services can operate over 15 kHz or less of paired spectrum" and "are generally more immune to interference from adjacent channel broadcast signals than television receivers are from adjacent channel land mobile signals."[15] Finally, KM Communications asserts that language in the *NPRM* supports the conclusion that "the spectrum requirements for potential new fixed and mobile uses are unknown" and that "channelization of the spectrum based on these unknown requirements would be speculative . . . ."[16]

Contrary to assurances made by advocates of new broadcast services, the Commission's proposed shared use may effectively preclude the provision of viable land mobile services in many markets, including 3G services.[17] Furthermore, many of the technical assumptions underlying arguments in favor of broadcast use are flawed. Broadcast television has traditionally not needed to be optimized for high spectrum efficiency. In contrast, land mobile systems have been optimized for years for high spectral efficiency and are by far the most

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13 Disney at 5; AMSTV at 2-3.

14 Disney at 4.

15 AMSTV at 4.

16 KM Communications at 2-3.

17 AirTouch at 11-16; ITA at 4-7, 8-11; RTG at 10-12; U S WEST at 6-9; *see also* AMTA at 11-13. Adjacent channel interference concerns exist not only for the 746-764 and 776-794 MHz bands, but in the adjacent spectrum allocated for public safety use. *See* APCO at 2-5; Fire Chiefs at 2-3; Motorola at 14-16.

spectrally efficient radio systems to date. 3G systems currently under standardization have undergone even further optimization in order to accommodate expected growth in mobile subscribership in coming years.

First, and contrary to KM Communications' contentions, land mobile services *are* well-standardized and capable of delivering a variety of services. In contrast, services and equipment for broadcast TV are comparatively less standardized and, given the speculative nature of the services proposed by Disney and, as discussed below, CEMA, it is far more likely that new and innovative land mobile services can be offered to consumers over this spectrum in the near future.[18]

In addition, most second-generation digital mobile services need much wider bandwidth channels than the 15 kHz bandwidth AMSTV asserts.[19] Indeed, for 3G systems, current standards are 1.25 MHz channels for CDMA2000 1X, and 5 MHz channels for WCDMA. Moreover, AMSTV's arguments regarding the lack of necessity of paired licensing for mobile applications is mistaken. 3G systems are not necessarily asynchronous and, indeed, CDMA2000 will be a synchronous system.[20]

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[18] *See* Disney at 5 (would "like an *opportunity to explore*" new broadcast-type services); Section III *infra* (discussing CEMA's proposed service).

[19] TDMA-IS136 needs a 30 kHz channel, GSM needs 200 kHz, and cdmaOne IS-95 needs 1.25 MHz channels.

[20] While it is simpler to provide asymmetrical service (*e.g.* web browsing) using an unpaired band with the time division duplex (TDD) mode of operation, TDD has many operational restrictions. Due to the timing between transmit and receive, there is a limit on transmission distance; also, the switching transient between the transmit and receive cycle also limits maximum power which, in turn, imposes further limitations on the coverage distance. Thus, most TDD systems are used for campus coverage or in-building applications and *not* wide-area applications. Indeed, this is why all cellular standards are based on frequency division

(continued...)

Moreover, and also contrary to AMSTV's comments, broadcast television generally causes more problems for mobile users than vice versa.[21] Handheld mobile terminals rarely cause noticeable interference to television receivers unless the user comes into very close proximity to the television antenna. Additionally, most mobile terminals utilize power control and, moreover, the likelihood of a single mobile terminal -- much less two mobile terminals -- coming into such close proximity as to cause noticeable interference is low. Finally, within short distances, the cross-coupling of energy from the different polarizations of the respective services is low, thus providing further protection to the television reception. As for interference between broadcast and base station transmission, the transmit-power of the latter is typically 10,000 times lower than the television transmission and generally subject to power control. Moreover, the base station transmit antenna polarization is vertical, whereas television reception is horizontal. Given the television reception environment, there is generally little to no cross-polarization coupling.

In contrast, the high-power requirement for broadcast will result in significant interference to mobile systems throughout a large segment of the broadcast service area. Television transmitters utilize high elevation and operate at very high transmit power, and out-of-band spurious emissions are less well controlled than for mobile systems. This will result in harmful interference to base station reception as dual polar diversity reception is increasingly used. Television transmitters will also cause interference to mobile receivers due to the high

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[20] (...continued)
duplexing instead of TDD, and why 3G systems have been designed to use frequency division duplexing with symmetrical forward and reverse link in one of its key modes of operation.

[21] *See* Table 1 at Attachment.

power and cross-polarization coupling in the typical mobile reception environment. Addressing these problems would require use of sizeable guard bands -- thus resulting in inefficient spectrum use.

In addition, mobile systems standards are designed to be non-service specific, whether circuit switched or packet switched, and are able to support a variety of services beyond traditional voice telephony. Thus, it is likely that some broadcast-type services (such as video streaming) can be accommodated through land mobile services with the evolution of 3G data capabilities -- and, indeed, licensees should be free to offer such services via their land mobile service systems. Broadcast service, however, has no such flexibility to accommodate two-way service provision, and there is no indication that it will evolve in such a manner.[22] In short, to facilitate the deployment of innovative services such as "hybrid broadband and mobile" services, the spectrum should be licensed for land mobile use to accommodate 3G deployment --not new broadcast use. Indeed, licensing new broadcast use will inhibit the deployment of innovative new broadband mobile services in this spectrum.

Finally, while some commenting parties contend that shared use of these bands is feasible, the record indicates that "shared use" in the context of this spectrum means, for all intents and purposes, "broadcast use." The uncertainty posed by potential broadcast use in

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[22] As Disney acknowledges: "Six megahertz is the defined bandwidth of both analog transmission and the digital broadcast standard. *Television broadcasters are designed to receive only this standard through over-the-air reception.* Unlike wireless services, for which equipment is available for a variety of different standards and bandwidths, broadcasters *must* use the FCC-adopted standard to reach existing broadcast television receivers and this standard requires 6 megahertz channels. The digital broadcast standard is fully capable of delivering a wide array of *one way* non-broadcast services as well, either in addition to or in place of broadcast video programming." Disney at 4-5 (emphasis added).

neighboring bands and service areas will deter CMRS participation in the auction — particularly if, as some parties advocate, bands are licensed on an unpaired basis in smaller 6 MHz blocks.[23] While AMSTV touts the 470-512 MHz band as an example of mobile-broadcast sharing, as discussed above, AMSTV's optimism is premised on flawed technical assumptions.[24] Rather, as AirTouch and a number of commenting parties discussed, the Commission's experience with the 470-512 MHz band is hardly a model for this proceeding.[25] The Commission should instead license this spectrum for land mobile and fixed use, and exclude new broadcast services.

B. The Technical Advantages for Land Mobile Use of This Spectrum Further Militate Against Shared Broadcast and Land Mobile Use

As AirTouch briefly discussed in its comments, licensing this spectrum for land mobile services creates a number of efficiencies of scale and scope that other spectrum does not.[26] Use of lower frequency bands provides better radiowave propagation characteristics which, in turn, benefit land mobile consumers in a variety of ways. Due to better diffraction characteristics, it is easier for the signal to propagate between the base station and the mobile

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[23] Because incumbent broadcasters operating on a primary basis in the 746-764 and 776-794 MHz bands will be fully known to bidders of this spectrum, bidders can develop bidding strategies which take the necessary protection requirements into account. If new broadcast users are permitted in these bands, however, it will be impossible for bidders to know the full extent of the broadcast interference issues associated with any given license. Bidders will be unable to take these issues into account in developing a bidding strategy. As a result, such uncertainty will lead to a far less efficient outcome in an auction of this spectrum. *See* AirTouch at 13.

[24] *See* AMSTV at 9.

[25] *See* AirTouch at 13; AMTA at 12; ITA at 6-7; Motorola at 9.

[26] AirTouch at 8-11. Benefits include efficiencies in the development and manufacture of multiband handsets due to compatibility of components. Also, due to the maturity of UHF radio frequency technology, consumers will benefit from carriers' and vendors' ability to more rapidly optimize circuitry for multimode 3G handsets, thus improving the time-to-market for 3G equipment.

terminal; this is critical because it is not always possible to optimize the reception location for the mobile terminal. Use of a lower frequency also offers lower loss in transmission. Service in the 800 MHz band has approximately 10 dB of link budget advantage over the 1900 MHz band, and service in the 700 MHz band is even more favorable. This results in significant cost savings to land mobile operators and to customers. Finally, 3G services will require delivery of high data rates (384 kbps to pedestrians, 144 kbps to mobile units); the better propagation characteristics inherent in the use of a lower frequency would help to ease the rollout of third generation services.[27]

III. LICENSING THIS SPECTRUM FOR CEMA'S SPECULATIVE MMBS SERVICE IS PREMATURE

CEMA proposes that the Commission create and issue licenses for a new "terrestrial 'Mobile Multimedia Broadcast Service'" or "MMBS" in the 746-764 and 776-794 MHz bands to provide "[f]ree, over-the-air reception by the public of high-quality digital audio, information, and high capacity data services . . . ."[28] As described in CEMA's comments, this would apparently involve mobile receivers in automobiles with "top-of-the-line" receivers for MMBS transmission.[29] AirTouch submits that licensing *this* spectrum at *this* time for *this* service is contrary to the public interest.

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[27] Moreover, the value of this spectrum to the public for mobile uses is made even more acute by the fact that consumer demand for mobile services, by definition, requires use of land mobile spectrum. In contrast, subscribers can access broadcast and broadcast-type services using other spectrum (as provided for in the DTV transition) and via wireline/cable or satellite-based facilities.

[28] CEMA at 3.

[29] *Id.* at 9.

Given the highly speculative nature of this service, licensing this spectrum for MMBS in accordance with the timetable of the 1997 Budget Act would risk a number of important statutory objectives. Given noise levels inside vehicles, and the likely high cost of such equipment, AirTouch is skeptical that this market will extend beyond higher-end vehicles with superior soundproofing. In contrast, land mobile services and handsets are designed for widespread consumer use in a wide variety of mobile environments and, as the Commission recently acknowledged, are becoming even more affordable due to features like prepaid plans and intense price and service competition between carriers.[30] These disparities in consumer demand, in and of themselves, indicate that CEMA's proposal would result in much less intensive and efficient spectrum use than land mobile services, for which there is a demonstrated and ever-increasing demand.[31] Also, there appear to be considerable engineering obstacles to overcome if MMBS is to become technically viable.[32] In addition, CEMA asserts that this 36 MHz of spectrum could provide up to 75 independent program or data channels.[33] As most users would utilize only a small number of channels, however, licensing this full 36 MHz of spectrum

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[30] *See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Fourth Report*, FCC 99-136, at 7-16, 16-17 (rel. June 29, 1999) ("*CMRS Fourth Competition Report*").

[31] *Id.* at B-8.

[32] In this regard, CEMA refers to the use of Coded Orthogonal Frequency Division Multiplexing (COFDM) as a possible modulation process, a scheme which has been used in broadcasting and point-to-point applications. *See* CEMA at 6. The use of this scheme has already been subject to much academic study, however, and is understood to suffer from timing and synchronization restrictions among the frequency components in a real-life mobile environment. While it has long been considered for use in mobile radio environments, for technical reasons it has been considered unsuitable and never been selected.

[33] CEMA at 6.

would appear redundant. For these reasons, AirTouch would anticipate very little interest in an auction for MMBS spectrum and, in any event, expects that much auctioned MMBS spectrum would lie fallow for a considerable period of time.

Furthermore, much of what MMBS would purportedly offer to consumers is already "in the works" for 3G services. 3G services already are designed and standardized to provide multimedia services and data services, and such services already are appearing in second-generation services today in the United States and abroad.[34] Such services include high data rate bearer services, which can download content from providers and serve as a conduit for end-users to select specific music and programming. Thus, land mobile systems will, to a considerable extent, fulfill the requirements of transporting digital-quality programming to customers. Also, in contrast to mobile handsets, MMBS equipment will need to be installed in a vehicle, thus limiting the extent of the mobility of the service and its usefulness to consumers.

CEMA asserts that the 700-800 MHz band is ideal for its proposed services.[35] For the very reasons stated by CEMA, however, this spectrum is also highly suitable for land mobile services. Unlike MMBS, however, the latter are demonstrated to be more spectrum efficient, highly optimized for mobile environments, and can provide full duplex communications.

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[34] *See CMRS Fourth Competition Report* at 52-53, 56-57; Edmund Andrews, *Rush Is On in Europe for Wireless Data Services*, NEW YORK TIMES, July 27, 1999; Sheryl WuDunn, *Forced to Compete in Wireless Technology, Japan Becomes a Global Power*, NEW YORK TIMES, July 27, 1999. On July 29, 1999, AirTouch launched Net Access, an all digital mobile Internet access service in which data capable handsets are used in conjunction with laptop computers, and AirTouch intends to offer more comprehensive services soon involving smart phones and personal digital assistants. *See AirTouch Launches All-Digital Mobile Internet Service*, News Release, July 29, 1999.

[35] CEMA at 7.

AirTouch submits that allocating 36 MHz of this valuable spectrum to MMBS would benefit only a limited class of consumers in a distant period of time. In contrast, licensing as proposed by AirTouch and other CMRS providers offers more certainty that Congress' 1997 Budget Act objectives will be met. While MMBS may eventually evolve into a viable service at some point in the future, CEMA's proposed licensing is inappropriate given the statutory restrictions and expectations imposed on *this* spectrum.

CONCLUSION

For the reasons discussed herein and in AirTouch's comments, the Commission should license this spectrum for land mobile and fixed wireless services, to the exclusion of new, non-incumbent broadcast services. Such licensing would best serve the public interest and the Commission's statutory obligations.

Respectfully submitted,

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		Transmission		
		TV Transmitter	CMRS base station transmitter	CMRS mobile transmitter
Reception	TV receiver	N/A	No interference impact on TV receiver • Low transmit power (typically 10000 times lower than TV transmit power) • Tight control of out-of-band spurious by specification • Base station can utilize power control • Different polarization from TV receiving antenna • TV antenna reception environment usually experiences little or no cross-polarization coupling	No interference impact on TV receiver • Low transmit power from handset • Tight control of out-of-band spurious by specification • Mobile uses power control • Very few mobiles would be near to a specific TV receiver • Cross-coupling of energy between polarization is low • Distance from mobile to TV antenna has to be very close to cause interference • Poor shielding of the TV equipment from wideband interference from any electrical equipment would have a more dominant effect
	CMRS base station receiver	High interference impact on CMRS base station receiver • High TV transmit power, high out-of-band spurious emission, and high elevation antenna • TV transmission directly interferes with dual polar base station diversity reception	N/A	N/A
	CMRS mobile receiver	High interference impact on CMRS mobile receiver • High TV transmit power, high out-of-band spurious emission, and high elevation TV transmit antenna • Cross-coupling of horizontal polarized TV spurious into vertical polarization in many mobile receive environments	N/A	N/A

Table 1. Interference Between Broadcast Television and CMRS